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THE HISTORICAL BACKGROUND OF ENTOMOLOGY IN RELATION TO THE EARLY DEVELOPMENT OF AGRICULTURE IN CALIFORNIA

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INTRODUCTION

One of the most interesting aspects in the study of the development of entomology in California has been the correlation of historical facts forming the background of this comparatively new science. This state affords an unusual opportunity to study such development because of the great variations in the physical features of the country, which include elevations from below sea level to the crest of the Sierras, exceeding 14,000 feet altitude, and the arid deserts of the southwest to the humid north coastal regions. These physical features had much to do in isolating the fauna and flora so that many of the common destructive insects, native of the Great Plains and Great Basin areas, did not reach the Pacific Coast. Climatic conditions have also been of exceedingly great importance in this development. Embodying practically every conceivable condition from the semi-tropical, in southern California, to the frigid, in the high mountains, the average climate is mild as has been clearly demonstrated by the development of a most unusual and varied agriculture in what was, before the advent of the white man, practically a desert insofar as food-producing crops were concerned. Acorns, pine nuts and other seeds, berries, bulbs, and roots of native plants afforded the vegetable diet of the aboriginies. The only pretense at primitive agriculture was practiced by a few Indians along the flooded lowlands of the lower Colorado River, where maize, beans, and melons were produced in very small quantities.

It is true that there were many native species of insects in this state. Few areas in the entire country have produced a larger or more varied entomological fauna and few places have been so attractive to the entomological explorers and collectors, with the result that a very great many, if not most, of the insect species have been taken and described. How many there are can only be

conjectured. The difficulty of ascertaining the number is due to the cosmopolitan nature of the entomological workers, who have collected and described insects, and the many periodicals and languages by means of which their efforts have been made known to the world.

In 1913 Professor C. W. Woodworth[1] listed 9,622 species of insects as occurring in the state. Judging from such additions as I have been able to make, his list includes about one-third of all the known described forms to date.

By far the greater number of important insect pests occurring in California today and of consequence in relation to human welfare, domestic animals, and agricultural products, are of foreign origin. In a cursory check of these I counted at least 225 species which are certainly of economic importance. No doubt there are many more. It is not the purpose of this paper to either list or discuss these in detail. Some of them have been treated in A History of Entomology,[2] to which the reader is also referred.

While the wide range of climate has permitted the establishment of many kinds of pests within the state, the mass production of individual crops, like citrus, peaches, apples, pears, grapes, cotton, melons, etc., has been responsible for the favorable development of the different pests on these various crops and has usually made conditions more ideal for the pest in the new land than was possible under natural conditions in its native environment.

The Spanish or Mission Period—1769-1877.

The Spanish settlements in Alta California began with the establishment of the Mission San Diego in 1769 and their influence continued along the coast as far north as Sonoma until the beginning of Secularization in 1834 and was terminated by the Bear Flag Affair in 1846. The development of agriculture for the maintenance of the missions and to provide for the Indians was one of the chief aims of the Fathers.

"In establishing a Mission, the Fathers took along, among other things, all utensils necessary for cultivating the soil; also fruit, vegetable and flower seeds, trees, roots and vines for the orchard and garden, besides a good supply of wheat and corn wherewith to seed the fields. Horses, horned stock, sheep, hogs

[1] Guide to California Insects (Berkeley, 1913), 360 pp.
[2] Essig, E. O., A history of entomology (N. Y., Macmillan Co., 1931).

and poultry also formed an essential part of their outfits. The first lessons of industry taught the natives (aside from the construction of the Missions) were those connected with agriculture. Thus the early missionaries here were the first farmers in California—their farming, moreover, was on quite an extensive scale."[1]

Palou[2] has given an accurate account of the development and size of the livestock industry at the California Missions during the period from 1773 to 1787, and casual references to the production of agricultural crops, chiefly wheat, beans, and corn.

More complete reports, however, have been preserved by foreign visitors some of which are briefly stated in the ensuing paragraphs.

Among the early navigators who visited Alta California and referred to the agriculture of the Spanish settlers, the Frenchman La Pérouse,[3] made the following observations in September, 1786: "The soil is inexpressibly fertile. Every kind of garden plant thrives astonishingly. We enriched the gardens of the governor and the Missions with different grains which we had brought from Paris, which were in perfect preservation, and will add to the sum of their domestic enjoyments.

"The crops of maize, barley, wheat and pease, can only be compared to those of Chili. Our European cultivators can form no conception of so abundant a fertility. The medium produce of wheat is seventy or eighty for one, and the extremes sixty and a hundred. Fruit-trees are still very scarce, but the climate is extremely proper for their cultivation, and differs little from the southern provinces of France; at least the cold is never more intense, while the heats of summer are much more moderate, on

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[1] Ewer, W. B., History of California Agriculture, Pacific Rural Press, vol. 10, p. 312 (Nov. 13, 1875).

Simpson, Sir George, An overland journey round the world during the years 1841 and 1842 (American Edition, Philadelphia. Lea and Blanchard, 1847), pp. 153-223. Sir George Simpson was governor-in-chief of the Hudson Bay Company's Territories.

La Pérouse, J. F. G. de, A voyage round the world, performed in the years 1785-1788. (English translation, Robinson, London, 1799), vol. I, 539 pp., portrait of La Pérouse; vol. II, 531 pp.

Vancouver, George, A voyage of discovery to the North Pacific Ocean and round the world in 1790-1795 (London, Robinson and Edwards, 1798), vol. I, 432 pp., 7 pls.; vol. II, 504 pp., 5 pls.; vol. III, 505 pp., 6 pls.

Lelong, B. M., Horticultural history of California, Calif. State Board of Hort., Annual Rept., 1892, pp. 33-43 (1893).

[2] Bolton, H. E., Historical Memoirs of New California by Fray Francisco Palóu (Berkeley, U. C. Press, 1926), vol. I, 331 pp., 6 pls.; vol. II, 390 pp., 10 pls.; vol. III, 399 pp., 5 pls.; vol. IV, 446 pp., 10 pls.

[3] Op. cit. vol. I, pp. 441, 442; vol. II, p. 404.

account of the continual fogs which prevail in these countries, and communicate a degree of humidity very favourable to vegetation."

Thus it will be seen that foreign seeds were obtained in this instance, direct from France and is illustrative of the many sources from which agricultural products were, from the very beginning, introduced into the virgin shores of this new land.

In 1792, Vancouver[4] visited several of the Spanish settlements along the coast of California and made some observations concerning agriculture as practiced by the settlers of that time. The following excerpts are from his published report:

"Instead of finding a country tolerably well inhabited and far advanced in cultivation, if we except its natural pastures, the flocks of sheep, and herds of cattle, there is not an object to indicate the most remote connection with any European, or other civilized nation."

At the Presidio, San Francisco, "Two small spaces in the plain, very insecurely inclosed, were appropriated to kitchen gardens; much labor did not appear to have been bestowed either in the improvement of the soil, in selecting the quality of the vegetables, or in augmenting their produce; the several seeds once planted in the ground, nature was left to do the rest without receiving any assistance from manual labor."

Concerning the Mission gardens at San Francisco the following comment was made: "Even their garden, an object of such material importance, had not yet acquired any great degree of cultivation, though its soil was a rich black mould, and promised an ample return for any labor that might be bestowed upon it. The whole contained about four acres, was tolerably well fenced in, and produced some fig, peach, apple, and other fruit trees, but afforded a very scanty supply of useful vegetables; the principal part lying waste and over-run with weeds."

At the Mission Santa Clara, Vancouver found agriculture better developed, due, no doubt, to more favorable soil and climatic conditions. Concerning it he states:

"They cultivate wheat, maize, peas and beans; the latter are produced in great variety, and the whole in greater abundance than their necessities require. Of these several sorts they had many thousand bushels in store, of very excellent quality, which

[4] Op. cit., vol. 2, pp. 8, 9, 14, 19, 20, 36, 494 (1798).

had been obtained with little labour, and without manure. By the help of a very mean, and ill contrived plough drawn by oxen, the earth is once slightly turned over, and smoothed down by a harrow; in the month of November or December, the wheat is sown in drills, or broad cast on the even surface, and scratched in with the harrow; this is the whole of their system of husbandry, which uniformly produces them in July or August an abundant harvest. The maize, peas, and beans, are produced with as little labour; these are sown in the spring months, and succeed extremely well, as do hemp and flax, or linseed. The wheat affords in general from twenty-five to thirty for one according to the seasons, twenty-five for one being the least return they have ever yet deposited in their granaries from the field; notwithstanding the enormous waste occasioned by their rude method of threshing, which is always performed in the open air by the treading of cattle. The product of the other grains and pulse bears a similar proportion to that of the wheat. I was much surprised to find that neither barley nor oat were cultivated; on inquiry I was given to understand, that as the superior kinds of grain could be plentifully obtained with the same labour that the inferior ones would require, they had some time ago declined the cultivation of them. The labours of the field are performed under the immediate inspection of the Fathers, by the natives who are instructed in the Roman Catholic faith, and taught the art of husbandry. The annual produce is taken under the care of these worthy pastors, who distribute it in such quantities to the several persons as completely answers all the useful and necessary purposes.

"Besides a few acres of arable land, which we saw under cultivation near the Mission, was a small spot of garden ground, producing several sorts of vegetables in great perfection and abundance. The extent of it, however, like the garden at St. Francisco, appeared unequal to the consumption of the European residents; the priests, and their guard, consisting of a corporal and six soldiers. Here were planted peaches, apricots, apples, pears, figs, and vines, all of which, excepting the latter, promise to succeed very well. The failure of the vines here, as well as at St. Francisco, is ascribed to a want of knowledge in their culture; the soil and climate being well adapted to most sorts of fruit. Of this we had many evidences in the excellence of its natural unassisted productions."

In the Carmel Valley near the Mission Carmel "a few acres of land exhibited a tolerably good plant of wheat."

In referring to the Mission San Buena Ventura this interesting account is given:

"The average produce of their seed does not yield more than twenty-three for one in wheat, barley, and oats; the quality of which is not by any means equal to the same sort of corn grown in the more northern settlements. This inferiority is attributed more to the want of rain than to the comparative difference of the soil; since, although the soil and climate of the latter appeared to be more suitable to the agriculture of the open fields, yet the garden of Buena Ventura far exceeded anything of that description I had before met with in these regions, both in respect of the quality, quantity, and variety of its excellent productions, not only indigenous to the country, but appertaining to the temperate as well as torrid zone; not one species having yet been sown, or planted, that had not flourished, and yielded its fruit in abundance, and of excellent quality. These have principally consisted of apples, pears, plums, figs, oranges, grapes, peaches, pomgranates, together with the plantain, banana, cocoa nut, sugar cane, indigo, and a great variety of the necessary and useful kitchen herbs, plants and roots. All these were flourishing in the greatest health and perfection, though separated from the sea-side only by two or three fields of corn, that were cultivated within a few yards of the surf. The grounds, however, on which they were produced, were supplied, at the expense of some labour, with a few small streams, which, as occasion required, were conducted to the crops that stood most in need of water. Here also grew great quantities of the Indian fig, or prickly pear; but whether cultivated for its fruit only, or for the cochineal, I was not able to make myself thoroughly acquainted."[5]

Wheat, maize, and barley were produced in large quantities while smaller amounts of beans (frijoles), garbanzos, and peas also were grown.

According to Forbes,[6] in 1834 in all Spanish California there were but three crude flour mills which turned out a very inferior product. Oats were unknown. The potato, although it thrived well,

[5] Cochineal was propagated on opuntia cactus at some of the Missions in Baja California, but I have seen no record of its cultivation at the Spanish Missions in Alta California.

[6] Forbes, Alexander, History of Upper and Lower California (London, 1839), pp. 259-261.

was but little grown. Vegetables were almost unknown. Raisins and wine were produced in considerable quantities, as were also olives and olive oil.

The land was stirred by a crude plow which was for many years known as the California plow. It consisted of several heavy sticks, the one serving as a share was shod with a small piece of iron. In describing its use Beechey[7] relates the following incident at the Mission San Jose in November, 1826: "Their plough appears to have descended from the patriarchal ages. It will scarcely be credited as agriculture in other countries, that there were seventy plows and two hundred oxen at work upon a piece of light ground of ten acres."

Pasturage was the great industry; there were in California in 1834, according to Forbes, 216,727 black cattle, 32,201 horses, 2,844 mules, 177 asses, 153,455 sheep, 1,873 goats, and 834 swine, making a total of 408,116 domestic animals in addition to great numbers which were running wild. Poultry was also raised in considerable quantities. The small amount of exceedingly poor butter was made with the hands without a churn and the cheese "was of the worst description." At this time a fat ox could be bought for five dollars, a saddle horse for ten dollars, a mare for five dollars, a mule for ten dollars, and a sheep for two dollars. Eggs sold in San Francisco in 1822 for two dollars a hundred.[8] Hides, tallow, wool, wheat and a small quantity of wine were exported. In 1831 the value of all agricultural products in California was $86,286.[9]

The hide ships began operating in 1824.[10] Whalers secured their supplies chiefly at San Francisco and Monterey, whereas the hide ships traded freely along the coast from Monterey to San Diego. The hide and tallow trade did not thrive until Mexico became independent. In 1841 and again in 1845 there were as many as fifty vessels on the coast, and the revenue during the last year amounted to $140,000. More than half of the ships were from New England.[11] A splendid idea of the hide and tallow trade as well as of the life

[7] Beechey, Capt. F. W., Narrative of a voyage to the Pacific and Beering's Strait in the years 1825-1828, new ed., vol. 2, p. 38 (1831).

[8] Forbes, Alexander, Op. cit., pp. 265-270, 328.

[9] Pacific Rural Press, vol. 16, p. 41 (July 20, 1878).

[10] Spanish or so-called Manila galleons from the Philippines began touching at the port of Monterey from 1779 onward and may have been responsible for the importation of plants and insects into California direct from the Orient.

[11] Cleland, R. G., A History of California—American Period (N. Y., Macmillan Co., 1922), pp. 41-43.

in California in those days may be obtained from the interesting records of Dana[12] and Robinson,[13] both of whom gave splendid accounts of the hide and tallow trade at its height.

The Mission period ended with the secularization of the Missions which took place gradually from 1834 to 1837, when the livestock and loose property were sold to the highest bidder.

The first orange trees grown at the Mission San Gabriel were by Padre Thomas Sanchez about 1804. These were propagated from seeds obtained from the Mission San Rafæl in Lower California. This orchard served as a nucleus for many which followed. A second planting from it was soon afterwards made by Don Luis Vignes at Azusa. Later J. W. Wolfskill, in 1841, set out an orange grove of two acres, later increased to seventy acres, on his ranch in Los Angeles. The latter was the first commercial orchard and was productive in 1874.

It was not until 1873 that Mrs. Eliza Tibbets brought to Riverside the two famous naval orange trees received from the U. S. Department of Agriculture, which had imported them from Bahia, Brazil. The famous seedling orange tree at Bidwell's Bar was planted in 1859.

Although the olive, fig, grape, deciduous fruits, citrus trees, and ornamentals were extensively planted about the Missions throughout California, it is interesting to note that not a single agricultural insect pest of any importance is known to have been introduced along with the cuttings, scions, and trees which were brought from Spain, Hawaii, South America, and probably also from Europe and the Orient during this early period.

According to Dr. E. C. Van Dyke, the first insect described from the Pacific Coast was a beetle, *Carabus tædatus* Fabr., taken by one of the members of Captain James Cook's third voyage, about 1778, presumably at Unalaska, Alaska. It was later presented to Sir Joseph Banks, who deposited it in the British Museum,

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[12] Dana, Richard Henry, Jr., Two years before the mast, a personal narrative of life at sea (N. Y., Harper and Bros. 1840) (Many editions, the later ones with additional notes). Dana sailed from Boston in the brig *Pilgrim* in August 1834. He reached Santa Barbara, California, in January, 1835, sailed as far north as Monterey; left San Diego in May, 1836, and arrived in Boston, September 16, 1836. The "agent" or "our agent" referred to in this book is no other than Alfred Robinson.

[13] Robinson, Alfred, Life in California (New York, 1846) (Several later editions). Robinson came to California in 1829 to act as agent for Bryant, Sturgis & Co., Boston trading merchants, who were owners of the brigs *Pilgrim* and *Alert* referred to by Dana. He returned to Boston in 1837 to 1840 and was there again from 1842 to 1849. After this he lived in California until his death in 1895. His long residence and extensive travels in the state make his records of great importance.

where it was later noted by Johann Christian Fabricius when he visited England in 1801. Fabricius described it in 1806.

The granary weevil, *Sitophilus granarius* (Linn.), and the rice weevil, *S. oryzæ* (Linn.), both appear to have been introduced with the seed wheat, barley and corn at all the Missions.[14] Forbes[15] remarks that "maize in warm countries is liable to spoil and to be infested by an insect called in Spanish *gorgojo* (weevil); and as it is found that maize keeps longer in the husk, it is sometimes left so till it is required for use; but although it may be kept somewhat longer in this state than when separated, yet it is also soon subject to the attack of this insect."

The bean weevil, *Mylabris obtectus* (Say), was so common throughout the country that it must also have been brought in at an early date and also probably occurred in the many varieties of beans grown by the Indians of the Southwest.[16]

Lice and fleas were abundant among the Indians and common among the Spanish. California early got a bad reputation for fleas—a reputation largely established by early voyagers who visited the coast during this period. Capt. Frederick William Beechey,[17] who visited San Francisco Bay and the neighboring settlements in 1826, sent three of his men overland to Monterey, November 9, 1826, to purchase supplies, and relates this incident: "They arrived at a farm house about half way between San Francisco and Santa Clara, called La Pulgas[18] (the fleas); a name which afforded much mirth to our travelers, in which they were heartily joined by the inmates of the dwelling, who were well aware that the name had not been bestowed without cause (op. cit. p. 44). Here, had there been accomodation, and had the place not acquired the reputation its name conveys, they would willingly have ended their day's journey; but the idea of *las pulgas*, sufficiently numerous in all the houses of California, determined them to proceed as soon as they conveniently could."

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[14] Essig, E. O., Some insects from the adobe walls of the Old Missions of Lower California. Pan-Pacific Ent., vol. 3, p. 194 (1927).

[15] Forbes, Alexander, Op. cit., p. 255.

[16] Adult specimens of the bean weevil have been taken with lima beans from the Inca graves at Ancon, Peru, which antedate the arrival of the Spanish there. Essig, E. O., Origin of the bean weevil, Jour. Econ. Ent., vol. 22, pp. 858-861 (1929).

[17] Beechey's Voyage to the Pacific and Beering's Strait in the Years 1825-1828. New ed. 2 vols., vol. 2, pp. 44-45 (1831). (In the ship *Blossom*).

[18] In 1831 Alfred Robinson visited "El Rancho de las Pulgas which was the property of Donna Soledad Ortega, widow of Don Luis Arguello, former Mexican Governor of California" (1823-1825) (Op. cit., p. 58) and was delightfully entertained by the charming lady. He made no mention of fleas, so that the place was probably ordinary in this respect.

The Spanish ships which transported supplies and livestock to the Mission settlements along the coast and subsequent whalers and traders, undoubtedly carried the house fly, *Musca domestica* (Linn.); the stable fly, *Stomoxys calcitrans* (Linn.); the bluebottle flies, *Calliphora erythrocephala* (Meigen) and *C. vomitoria* (Linn.); the greenbottle flies, *Lucilia sericata* (Meigen) and *L. cæsar* (Linn.); the black blowfly, *Phormia regina* (Meigen); and the tropical blowfly, *Paralucilia fulvipes* Macquart (*Chrysomyia wheeleri* Hough). All of these found conditions favorable for rapid increase and soon became pestiferous. The only reference I was able to find as to their abundance is in Beechey's[21] account of a trip to the Mission San José in November 1826, in which he states that the Padres "had been so long excluded from the civilized world that their ideas and their politics, like the maps pinned against the walls, bore date of 1772, as near as I could read it for fly spots."

According to Dr. E. C. Van Dyke, these ships also carried the carabid beetle, *Pristonychus complanatus* Dejean, as far north as San Francisco Bay. Cockroaches, bedbugs, and itch and scab mites were also brought in by the earlier settlers. The later whaling, fur, and hide ships[22] added generous entomological contributions in the form of the red-legged ham beetle, *Necrobia rufipes* (De Geer); the buffalo carpet beetle, *Anthrenus scrophulariæ* (Linn.); the larder beetle, *Dermestes lardarius* Linn.; the hide and tallow dermestids, *Dermestes marmoratus* Say, and *D. vulpinus* Fabr.[23]; the white-marked spider beetle, *Ptinus fur* Linn., and no doubt a great many other insects which live in excrement, dried animal matter, and cereals. A native dermestid beetle, *Dermestes talpinus* Mann., was also widely distributed in these ships.

"John K. Townsend, the companion of the botanist, Thomas Nuttall[24] (who returned from California to Boston on the Brig

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[21] Beechey's Voyage, etc., Op. cit., vol. 2, p. 34.

[22] The whalers and fur ships obtained supplies from Bodega Bay, San Francisco, and Monterey, while the hide and tallow ships plied along the coast from San Diego to San Francisco Bay.

[23] "At one time the ravages of *Dermestes vulpinus* Fabr. were so great in the skin warehouses of London, that a reward of £20,000 was offered for an available remedy." Baird's Cyclop. Nat. Sci., London, 1858). Ent. News, vol. 1, p. 238 (1895).

[24] Thomas Nuttall, a distinguished English botanist, succeeded W. D. Peck as curator of the Harvard Botanic Garden in 1822. He remained until the winter of 1833-34, when he resigned to undertake this exploring and collecting trip to the Pacific Coast. He named a great many important California trees and other plants.

Pilgrim with R. H. Dana, Jr., in 1836), on his trip overland to the Pacific Coast, collected in the neighborhood of Fort Vancouver on the Columbia River during 1834-1835, and brought back on his return numerous insects to the Philadelphia Academy of Natural Sciences. Dr. Thaddeus William Harris described a number of these and sent the paper to the Academy for publication early in 1838, but it was never published. Three species of the *Cychrini*, *Cychrus tuberculatus* Harris, *Scaphinotus angulatus* (Harris) and *S. cristatus* (Harris), were, however, described in a later paper, 'Remarks upon the North American Insects belonging to the Genus *Cychrus* of Fabricius,' published January, 1839, in the Boston Journal of Natural History. In 1838, L. Reiche described the well known tiger beetles, *Omus dejeani* Reiche and *O. audouini* Reiche, collected in Oregon, in the Annals of the Entomological Society of France (VII, p. 297-302, 1838). Where he secured his specimens he does not state, but I am inclined to believe that they were collected by Townsend. The great expedition of Captain Charles Wilkes, 1838 to 1842, spent considerable time in Oregon and various members collected many insects there. These were stored with the other valuable material secured in Washington, where I believe most of it perished. There were only two specimens of that rich collection of insects that have survived as far as I know, *Callisthenes wilkesi* (Leconte) and *C. moniliatus* (Leconte), which fell into the hands of Dr. LeConte, who described them in 1851.[25] They are now preserved in the LeConte collection at the Museum of Comparative Zoology at Cambridge, Massachusetts. In connection with this great period, the great work of Sir John Richardson, the 'Fauna Boreali-Americana' should be mentioned. In the volume on insects, written by William Kirby and published in 1837,[26] many insects were described, which though not secured on the Pacific Coast, have a range which carries them to our Northwest Coast (and to California) and thus makes it impossible for one to study our northern fauna without consulting this classical work."[27]

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[25] LeConte, John L., Desc. of new species of Coleoptera from California, Lyceum of Nat. Hist. of N. Y., Ann. pp. 125-216 (1851).

[26] The Insects of Richardson's Fauna Boreali-Americana, IV (London, 1837), vol. 4, 325 pp., 8 pls.

[27] Van Dyke, E. C., From an unpublished paper entitled Early Entomologists on the Pacific Coast and their Work.

NOTES ON THE GENUS ROTHSCHILDIA IN THE UNITED STATES

(Lepid., Saturniidæ)

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Dr. W. T. M. Forbes of Cornell University has called the attention of the writer to the confusion in the application of names to the species of *Rothschildia* found within the United States. In order to eliminate this confusion a résumé is given of the various names applied by prior authors. One new species and one new color form are described, one previously described form is recorded, and the synonymy of six other specific and varietal names is discussed.

ROTHSCHILDIA SPLENDIDA DeBeauvois

The only specimens belonging in the *splendida* group in the National Museum, excepting the Neotropical collections, are three examples received with the William Barnes collection. One of these is a male labeled "S. W. Texas 1906" and appears to be *erycina* Shaw with an incorrect locality label. A female, agreeing with this male, lacks data. The third specimen is a male labeled "Cochise Co., Ariz." and is *R. splendida mexicana* Draudt. Possibly this locality label is correct, but until other specimens are found the species should not be recorded from the United States.

Prior references to *splendida* from the United States are based upon specimens of *forbesi*, a new species described below, or upon specimens of *orizaba* Westwood, and are discussed under these names.

ROTHSCHILDIA ORIZABA Westwood

Most of the specimens in collections are of Mexican origin, almost all of the larger collections possessing unlabeled specimens which either emerged from Mexican cocoons, or were bred from eggs from Mexican stock. The species was extensively propagated in New York City about twenty years ago.

Single specimens are before the writer labeled "Texas" and "Ariz." The only example bearing definite data is a single female labeled Brownsville, Texas, VI-11, received with the Brooklyn

Museum collection. Even this record should be viewed as possibly erroneous until substantiated by additional specimens.

Hulst (1885, Ent. Amer., I, 160) stated that *splendida* and *orizava* (!) "were identical."[1]

ROTHSCHILDIA JORULLA Westwood

Specimens which agree thoroughly in all superficial characters with this Mexican species were received with the Brooklyn Museum collection, and were originally obtained by Jacob Doll and Carl Schaeffer on the Esperanza Ranch, about six miles southeast of Brownsville, Texas. The genitalia agree with those of Mexican specimens except for slight, and presumably insignificant, differences in the exact shapes of the harpes. Three of these Texas specimens are of the dark purplish form, typical *jorulla*, the only examples of this form from the United States and in the National Museum. Most of the Esperanza Ranch specimens show the red tones which distinguish form *guerreronis* Draudt. The latter is also represented in the National Museum by specimens labeled "Ariz.," but these labels may be incorrect.

The *Rothschildia* which is abundant in the Rio Grande Valley of Texas, and which has been labeled *jorulla* in recent collections is *forbesi*, a new species described below.

ROTHSCHILDIA JORULLA CINCTA Tepper

Attacus cinctus Tepper (1883, Bul. Brooklyn Ent. Soc., V, 65, ff. 1-2) was described from eight specimens, representing both sexes, reared from cocoons "found in Southern Arizona by Mr. Robert Driver." Three specimens, females, are in the National Museum, one being labeled in red ink "Arizona" "Original type." In superficial appearance *cincta* is almost identical with *maurusia* Draudt, but probably belongs in the *jorulla* complex. The name is certainly not strictly synonymous with typical *jorulla*, and until a series of males are obtained may be listed as a sub-species.

Rothschildia forbesi Benjamin, new species.

Closely related to *R. jorulla*, and superficially differing principally in the course of the extra discal line of the fore wing. The former species has this line outwardly oblique from somewhat below the costa to the hyaline discal spot, and usually produced to a point on each vein below the costal area; the new species has this line incurved in the region between the costa and the discal spot, slightly

[1] See notes under *R. forbesi*.

pointed on vein 7, and strongly produced to points only on veins 2 and 3. The average size of the new species is somewhat smaller than that of *jorulla*.

The male genitalia present conspicious differences. In situ *R. jorulla* has the harpe deeply cut on its ventral margin so that a long finger-like dorso-ventral arm occupies the distal portion, and the juxta is deeply excavated for the ædœagus. *R. forbesi* has the harpe only slight cut, the distal arm being a lobate tip rather than a finger-like process, while the juxta is simply bent around the ædœagus and is not excavated for the reception of that organ. *R. lebeau* Guérin has a juxta similar to that of *forbesi*, but the harpe is similar to that of *jorulla*. Other differences exist between the genitalia of the above named species, principally in the shape of the harpes, the unci, and the apices of the ædœagi.

Expanse: ♂, 88-100 mm.; ♀, 100-110 mm.

The new species occurs in two color phases, a dark form and a light form. These color forms may represent only dimorphism, or possibly represent local "wet" and "dry" forms depending upon whether the individuals breed in the humid bottoms which were once river courses or in the semi-desert areas. The types of *forbesi* are specimens of the dark form, the ground color being dark purplish tinted with olivaceous.

Holotype ♂ and allotype ♀, Brownsville, Tex., Mar. 1-7; 38 ♂ 24 ♀ paratypes from various localities in southern Texas, dates Feb. 2 to Nov. 9; also 1 ♂ and 1 ♀ paratypes, emerged in Washington, D. C., from cocoons from Monterey, Mexico, "7009, iss. July 1, 96" and "7009, iss. July 6, 97." Cat. No. 44085, U. S. N. M.

Types in U. S. National Museum; paratypes in U. S. National Museum, Cornell, Rummel, Fred Lemmer and Fritz Lemmer collections.

Egg: Described from unfertile eggs. White; broadly oval, flattened, smooth; length 1.8 mm., width 1.4 mm., height approximately 1 mm.

Larvæ: Described from alcoholic specimens supplied by Mr. Fritz Lemmer, the exact shades of the pale colors and of the greens obviously not available. Tubercles nearly uniform in size in each stage, excepting the last.

Stage 1. (from larva beginning to molt). Head diameter .8 mm. Head and body with the ground color pale; the former marked with a variable amount of fuscous-brown and black creating the appearance of a dark head with paler areas which include most of the front, reach across the epicranium and mark each side of the vertex. Otherwise the larva is colored much like Packard's figure

of first stage *R. cinctus* (1914, Mono. Bomb. Moths., III, pl. 4, f. 4) excepting that the black is more restricted, surrounding the lateral and dorsolateral body tubercles and giving the appearance of five longitudinal lines connected by cross bands on a yellowish ground.

Stage 2: Similar to stage 1 with the following exceptions. Length about 15 mm. Head about 1.3 mm. in diameter with the black so intensified that the pale areas appear as spottings on a black ground.

Stage 3. Length about 16 to 24 mm. Head about 2 mm. in diameter, otherwise similar to that of stage 2. Body almost entirely black excepting faint pale intersegmental lines and conspicious pale tubercles on pale bases; the general appearance being that of a black caterpillar with pale spottings.

Stage 4. Length about 28 mm. Head about 2.6 mm. in diameter. Larva similar to that of stage 3 but the pale areas extended and green or greenish, so that the head appears greenish with the black defining the sutures and laterally marking the epicranium. The body with black intersegmental areas, but dorsally appearing greenish with broken black median line; laterally the tubercular areas surrounded by black creating a checkered appearance.

Stage 4a? (judging from the head size apparently an adventitious molt). Length more than 40 mm. Head about 3 mm. in diameter, marked like that of stage 4. Body mainly leaf green with a few black markings; each leg black with yellow markings; each proleg strongly marked with black which encloses a pale patch, the pale patch on the base of the anal proleg large and neatly defined by jet black which forms a triangle with somewhat circular sides; a conspicious black patch on the prothorax including the shield and diffused ventrally to include the spiracle; a diffused lateral patch caudad of the tubercles of the mesothorax, attenuated dorsally; anal shield mainly black with a conspicious pale central marking shaped like an hour-glass; most of the tubercles paler than the body and equipped with black setæ, but the tubercle immediately above the leg on each side of each thoracic segment marked with black, conspicious on the first two segments, as two minute dots on each side of the third segment; caudal tubercle on the last abdominal segment more or less marked by black; a faint pale stripe on the dorsum of the second abdominal segment extending nearly to the spiracle; a similar but clearly defined stripe on each of the five following segments but extended to the tubercle; a similarly colored stripe beginning near the base of the ventral tubercle on the eighth abdominal segment and continuously extending caudally just below the ventral tubercles across the segments to the anal shield.

Last stage (stage 5?): Head about 4.3 mm. in diameter, colored like that of the preceding stage (termed 4*a*). Larva about 70 mm. in length; leaf green; the black markings of the legs and prolegs

similar to those of the preceding stage; no intersegmental black; prothoracic shield with a faint dorso-caudal black dot and with two caudal black bars, one defining each caudo-lateral margin; anal shield and the shield-like area at the base of each anal proleg shining greenish yellow strongly margined by neat jet black; all tubercles pale excepting those at the edge of the prothoracic shield which are distinctly tinged with fuscous, the normal tubercles all nearly of a uniform small size, the compound dorsal tubercle on the eighth abdominal segment inconspiciously the largest; pale body stripes similar to those of the preceding stage but much more conspicious.

Food plants: Willow; privet in confinement.

Notes: This species is the only one usually identified as *jorulla* in collections from the United States. It is the species upon which the first records of *splendida* from the United States are based, having been so misidentified by Clemens (1860, Proc. Acad. Nat. Sci. Phila., p. 160). It is the *splendida* of many of the early lists, but is not *splendida* of Hulst and several workers formerly living in or near Brooklyn, N. Y., who from about 1885 to 1900 or later distributed *orizaba* as *splendida.* It is also *erycina* in part of Packard and Cockerell (1914, Mono. Bomb. Moths, III, 257, pl. XLV, f. 3 and LXX, f. 3, but not pl. XLV, f. 4). The latter authors figured one of the Clemens specimens, but erroneously placed *splendida* DeBeauvois in the synonymy of *erycina* Shaw.

Rothschildia forbesi draudti Benjamin, new form.

To specimens with the ground color fawn, more or less tinted with red, the varietal name *draudti* is applied. This is a parallel form to *R. jorulla* form *guerreronis* Draudt.

Type, localities and number and sexes of types: Holotype ♂, Brownsville, Tex., "10-19"; allotype ♀ and 3♂, 1♀ paratypes, same locality, no date; 3 ♂ paratypes, same locality, "10-14," "10-17," "10-19"; 1 ♂ paratype, same locality, "7-11," (Geo. Dorner); 2 ♂ paratypes, San Benito, Tex., Apr. 24-30, May 1-7; 1 ♀ paratype, "ex pupa received from Texas, emerged in Washington after 2 years," and cocoon of same; 1 ♂ paratype, "7009, Mexico, iss. July 6, 97" (emerged in Washington, D. C., from cocoon from Monterey). Cat. No. 44086, U. S. N. M.

Types in U. S. National Museum; paratypes in U. S. National Museum, Cornell, and Fritz Lemmer collections.

Notes: The last mentioned male paratype was figured by Packard and Cockerell (l. c., p.. LVII, f. 1).

STUDIES AMONGST THE COCCINELLIDÆ, NO. 6—NEW SPECIES

BY F. W. NUNENMACHER

Piedmont, California.

Scymnus schuberti Nunenmacher, n. sp.

Form oval, pronotal and elytral outlines nearly continuous. Color black, with orange-yellow markings, last two ventral abdominal segments and legs testaceous. In the male the head, and sides of the pronotum narrowly orange-yellow, in the female these parts are entirely black. In both sexes each elytron has two orange-yellow dots, one small, rounded and median at one-third from base, the other irregular and a little larger at two-thirds, in line with the first.

Head impunctate, pronotum and elytra very thickly, minutely punctured and with a short, white pubescence. Ventral surface and legs minutely punctured. Length 1.25 mm.; width .75 mm.

Types, male and female, and seven paratypes in my collection.

Type locality: Benson, Arizona, collected by myself on October 4, 1906. Three of the paratypes are from the type locality; two from Placerville and two from Shasta, California, all taken by myself.

Var. A. In all respects the same as the type with the exception that only the anterior spot on each elytron remains, the other being entirely obsolete. Two specimens, one from Shasta, the other from Humboldt County, California, taken by myself.

Schuberti belongs to Group B, of Horn's table, the metacoxal line following the first suture. It has almost the same markings as *S.myrmidon* Muls. which belongs in Horn's Group A. *Schuberti* may be in collections under the name *guttulatus* Lec., in the latter the spots are somewhat double, seldom round. I dedicate this species to my friend, W. H. Schubert.

Scymnus scotti Nunenmacher, n. sp.

Form oval, outline continuous. Black with color markings disposed as follows: Head ferruginous in both sexes, pronotum black, front narrowly, sides broadly, ferruginous; each elytron with a broad vitta starting at the callous and running toward the suture and to three-fourths the length, where it widens out from margin to suture and apex. Head and pronotum finely punctured. Elytra with a short whitish pubescence; punctation a little coarser. Ven-

tral surface black, thickly and coarsely punctured, post-coxal plates also coarsely punctured. Legs ferruginous. Length 1.5 mm.; width 1 mm.

Types, male and female, and one paratype in my collection.

Type locality: Alhambra Valley, Contra Costa County, California (F. T. Scott); paratype, Vine Hill, Contra Costa County, June 26, 1908 (F. E. Blaisdell).

Scotti belongs in Group D of Horn's table, the metacoxal line complete, making a full arc.

Scymnus quercus Nunenmacher, n. sp.

Form oval, outline nearly continuous. Color ferruginous throughout and clothed with a short white pubescence. Pronotum and elytra thickly and very minutely punctured. Ventral surface fuscous, legs and last four abdominal segments testaceous; punctures hardly visible. Length 1.25 mm.; width .75 mm.

Types, male and female, and four paratypes in my collection, kindly presented to me by Dr. F. E. Blaisdell.

Type locality: Vine Hill, Contra Costa County, California. Collected by F. E. Blaisdell, November 25, 1910, from Live Oak (*Quercus agrifolia* Neé).

This species comes under Horn's table in Group C, the metacoxal line curving but not making a full arc. It resembles *S. debilis* Lec. somewhat in size and color; *debilis* belongs to Group A.

Hyperaspis biornatus Nunenmacher, n. sp.

Color black with yellow markings: One large spot on each elytron a little behind the middle, close to the margin, but not touching it; another small juxta-apical spot joined together by a narrow band giving it the appearance of a dumb-bell. Head yellow, pronotum with the sides broadly yellow, surface finely and rather closely punctured; elytra a little more coarsely punctured. Ventral surface rather coarsely punctured. Anterior legs yellow, the others black, tarsi piceous. Described from the male. Length 3 mm.; width 2.25 mm.

Type, a male in my collection.

Type locality: Livermore Hills, Alameda County, California. Collected by Kenneth Masero in June, 1933.

Biornatus can readily be separated from *H. lengii* Schaeffer, by the spots being behind the middle and closer to the margin; in *lengii* they are larger, wider apart and the anterior spot is in the center of the elytron.

Hyperaspis leachi Nunenmacher, n. sp.

Form convex oval. Color shining black, a large orange spot involving the whole of each elytron, excepting a small band at the basal margin, the callus (in the male,) a narrow sutural line that widens out at apex of the elytron and a very narrow bead the length of the margin, black. Head punctured, yellow in the male and black in the female. Pronotal front very narrowly, sides broadly yellow; surface rather thickly and finely punctured, the punctation denser and coarser than on the elytra. Ventral surface entirely black and finely punctured. Anterior legs yellowish, the posterior black with the knees and tarsi yellow. Length 2.20 mm.; width 1.75 mm.

Types, male and female, and one paratype in my collection.

Type locality: Riverside County, California, collected by E. R. Leach on March 25, 1918. Paratypes females: one in the collection of F. E. Blaisdell, Museum of the California Academy of Sciences, collected at San Diego, California; the other was taken in Sonoma County, California, by Dr. Blaisdell, on July 10, 1902.

H. leachi will follow *panzosæ* Gorh. in our lists.

Hyperaspidius horni Nunenmacher, n. sp.

Color testaceous, with a small triangular spot at each side of the scutellum dark brown. The female is a little darker. Pronotum polished and finely punctured. Elytra rather coarsely punctured. Ventral surface very finely punctured. Length 2 mm.; width 1.25 mm.

Types, male and female in my collection.

Type locality: Buena, N. J., without any other data (Chas. Liebeck).

The locality of the female cannot be made out, but it is dated July 1, 1894, collected by F. Knab. The male of this species was labeled "n. sp." by Dr. Geo. Horn.

Hyperaspidius mexicanus Nunenmacher, n. sp.

Described from the male. Color light testaceous and rather transparent, with black markings. Pronotum black, front and sides narrowly bordered with testaceous. Pronotum and elytra very finely and thickly punctured. Elytra with a narrow black vitta on the suture, which starts at the anterior end of the suture where it is widest, extends posteriorly three-fourths the length, where it ends in a point.

Head and mouth-parts testaceous. Ventral surface black, very finely and thickly punctured. Legs testaceous. Length 2 mm.; width 1.17 mm.

Type, a male in my collection; one male paratype.

Type locality: Mexico, October, 1907. There were several specimens in the Albert Koebele collection.

Microweisea ovata Nunenmacher, n. sp.

Described from a male. Color shining black, polished. Head, mouth-parts, anterior angles of pronotum, front legs and ventral segments, testaceous. Elytra finely and thickly punctured. Length 1.25 mm.; width .8 mm.

Types, male and female in my collection. Two paratypes in the collection of F. C. Hadden.

Type locality: Blairmont, B. G., S. America, collected September, 1928, by F. X. Williams. One cotype was taken in January, 1924, at Campus Rio de Janeiro, Brazil.

Adalia nigromaculata Nunenmacher, n. sp.

Color black with yellow markings. Head and mouth-parts yellow; base of the head from eye to eye black, the yellow extends into this black in the form of a three pointed crown with the middle spur the longest. The pronotal pattern is somewhat the same, with the sides yellow, and broadest at each angle with the center narrow giving it a crude crescent shape. In the female there is a small yellow dot on the thorax in front of the scutellum.

The elytral markings are a little different in all the seven specimens before me and are best described by saying that the yellow starts narrowly at the anterior margin, widening at the callus into a fascia at about one-third of the length, curving towards the suture but not reaching it, leaving a black line, the end at the suture rounded, then curving back to the margin where it widens into a broad square angle following the margin.

Elytra a little more densely and coarsely punctured than the head and pronotum. Elytral pattern somewhat as in *Psyllobora germari* Muls. Epipleuræ yellow, the tibiæ and tarsi pitchy black. Length 3.5 to 4 mm.; width 2 to 2.5 mm.

Types, male and female in my collection and four paratypes in that of F. C. Hadden.

Type locality: San Diego County, California, without other data, G. H. Field collector.

Ceratomegilla cottlei Nunenmacher, n. sp.

Described from a male. Color light yellow and black. Head black with a small triangular yellow spot in the center; surface thickly and rather coarsely punctured. Pronotum black, narrowly

edged with yellow, thickly and finely punctate. Elytra yellow with the suture edged with black, a broad vitta on each which is one-third the width of the elytron, starting at the base in the center, slowly broadening and extending three-fourths the length of the elytron where it is broadest, then narrowing to a blunt point but not reaching the elytral apex, leaving the tip yellow. Under surface and legs black, strongly punctate; pubescence short and white.

In the other two forms: *C. vittata* Mann. and C. *vittata* var. *similis* Casey, the vittæ reach the elytral tips. Elytral punctation about the same as that of the pronotum. Length 5 mm.; width 3 mm.

Type, a male in my collection.

Type locality: Yellowstone Park, collected July 8, 1930, by E. R. Leach. Kindly presented to me by the collector.

Hippodamia hoppingi Nunenmacher, n. sp.

Color yellow with black markings disposed as follows: Head black, with a small triangular yellow spot in the center. Pronotum black, the narrow front margin, excepting a small central point, and the anterior angles more widely, yellow, the yellow at the angles not connected with the margin. Elytra with a broad fascia and a somewhat kidney-shaped spot, black; the fascia begins at the callus, where it is rounded and broadest, and extends to the suture just back of the scutellum. The subapical spot is arcuate, larger and flexed inwardly, but does not touch the suture in any of the six specimens before me.

Head and pronotum thickly and finely punctured. Elytra a little more coarsely punctured. Ventral surface black; legs black and punctured a little more finely than the elytra. Length 4 mm.; width 3 mm.

Types, male and female, and four paratypes in my collection.

Type locality: Mt. Stillman, Tulare County, California, elev. 10,000 ft. The types were collected August 3, 1904, and one paratype at Franklin Lake on July 10, 1912, all by Mr. Ralph Hopping. This pretty little species was kindly given to me some years ago by my friend, Mr. Hopping.

A Correction

On page 159 of the October number of this journal the names of *Nomia californica* Ckll. and *Xenoglossodes eriocarpi* Ckll. became reversed. The Nomia was from Idaho and the Xenoglossodes from Arizona. Also on page 185, line 14, the word "bololorus" should read "bicolorous".

A NEW BROCHYMENA

BY E. P. VAN DUZEE

Brochymena pilatei Van Duzee, n. sp.

Allied to *sulcata*, longer, paler in color, wanting the scattering black punctures and with different male claspers. Length 13 mm.

Head distinctly arcuate before the eyes, about rectilinear in *sulcata*; cheeks exceeding the tylus, sometimes somewhat connivent but rarely touching before its apex. Pronotum about as in *sulcata*, sides sinuate, dentate for their whole length, the teeth being smaller on the humeral lobe. Scutellum less elevated and narrower behind the frenum; membrane reticulate with fulvous-brown instead of black, these reticulations nearly obsolete at times; antennæ and feet as in *sulcata*; puncturation of upper surface irregularly distributed but more uniform in size than in *sulcata*, a few about the base of the scutellum being larger and black, the scattering large black punctures found on the pronotum in *sulcata* being wanting in *pilatei*. Last ventral segment of male sulcate as in *sulcata*, the fringe of long hairs heavier and nearly meeting over the smooth depressed area; claspers somewhat shoe-shaped, broader and more triangular than in *sulcata* with a distinct heel, narrower with rounded angle in *sulcata*.

Color paler, with a fulvous-brown effect, produced by the castaneous punctures on a yellowish ground color, with a few pale calloused spots, especially on the elytra; antennæ back with pale incisures; beneath yellowish ferruginous, the pectoral pieces with groups of black punctures laterally; sides of cheeks below, a broken annulus on apex of femora, an apical annulus and about three spots on the tibiæ and the apex of the tarsi black; vestiture beneath pale, of short hairs on the venter but mixed with long ones on the legs.

Holotype, male, No. 3839, and allotype, female, No. 3840, Calif. Acad. Sci. Ent., taken at El Centro, Imperial County, California, January 26, 1910, by G. R. Pilate and presented to the Academy of Dr. E. C. Van Dyke. Paratypes a long series with same data. Dr. F. E. Blaisdell has also taken this species at El Centro, December 4, 1927, and Mr. H. Gentry has taken it at Phoenix, Arizona, July 10, 1932. I have had specimens of this form in my own collection for many years that were taken by Mr. C. R. Biedermann at Florence, Arizona, June 8, 1903, and one from Phoenix taken March, 1897, but my material was not sufficient for properly distinguishing the species.

A SHORT REVIEW OF THE GENUS ATIMIA WITH THE DESCRIPTIONS OF TWO NEW SPECIES

BY E. GORTON LINSLEY

Oakland, California.

The genus *Atimia* is interesting because of the Lamiid-like aspect of its species. Their appearance is quite unique among the Cerambycinæ, but they are included in that subfamily because of the absence of an oblique groove on the anterior tibiæ. In the larval stage the various members of the genus attack trees of the Cupressaceæ and Taxodiaceæ, including *Cupressus*, *Libocedrus*, *Thuja*, *Chamæcyparis*, *Juniperus*, *Taxodium*, *Sequoia*, and their relatives. Three species have been previously described and these with the two characterized below bring the number of known species to five. These may be distinguished as follows:

Denuded areas of elytra irregular or vittiform, somewhat confluent 1

Denuded areas of elytra round, separate, not confluent; elytral apices obliquely truncate. 9-14 mm. Arizona, New Mexico ..... (1) *huachucæ* Ch. & Kn.

1. Elytral apices emarginate, the angles often dentiform 2

   Elytral apices rounded or truncate 3

2. Prothorax more or less quadrate; thoracic vittæ subparallel; denuded areas of elytra vittiform. 6-12 mm. Pacific Coast of North America ..... (2) *dorsalis* Lec.

   Prothorax rounded at the sides; thoracic vittæ arcuate; denuded areas of elytra irregular, narrow, not vittiform. 8-10 mm. Eastern North America ..... (3) *confusa* Say

3. Reddish brown, pubescence pale luteus; prothorax one-fourth wider than long; antennal segments slender throughout; elytral apices truncate. 11-12 mm. Central Mexico ..... (4) *mexicana* n. sp.

   Dark brown, pubescence yellowish brown; prothorax nearly one-half wider than long; outer antennal segments distinctly flattened; elytral apices rounded. 8-12 mm. Central California ..... (5) *helenæ* n. sp.

1. ATIMIA HUACHUCÆ Champ. & Knull

This species is readily known by the round, separate, denuded areas of the elytra. In average size it is larger than any other known species. It occurs in southern Arizona and New Mexico on the Arizona Cypress, *Cupressus arizonensis*. In addition to those localities listed by Champlain and Knull, I have seen examples from Mt. Washington, near Nogales, Arizona, July 11 and 12, 1919 (Van Dyke collection, Calif. Acad. Sciences), Chiricahua Mts., Arizona, July 7, 1908 (Calif. Acad. Sciences coll.), and Carr Canyon, Huachuca Mts., Arizona, July, 1930 (collection of the writer).

2. ATIMIA DORSALIS LeConte

This is a fairly abundant species on the Pacific Slope, where it occurs from San Diego to British Columbia, attacking *Cupressus, Thuja, Libocedrus, Sequoia,* and other related trees. It is somewhat smaller than the preceding and differs from it in the confluent, vittiform, denuded areas of the elytra. The elytral apices are emarginate or emarginate-dentate, with the angles sometimes spiniform. The body is usually clothed with luteus pubescence, but examples apparently referable to this species from Oregon have pubescence varying from almost uniformly black to rufous.

ATIMIA CONFUSA Say

A. confusa is a well known species occurring in eastern North America from Texas to Canada. In general it is shorter and stouter than any of the other known species, with the sides of the prothorax rounded and the thoracic vittæ arcuate. The elytral apices are emarginate with the outer angle often acute, and the denuded areas of the elytra narrow and irregular.

4. Atimia mexicana Linsley, new species

Stout, reddish-brown, clothed with coarse luteus pubescence. Head short, broad, rather densely pubescent, with a smooth longitudinal vitta on the vertex; antennæ two-thirds as long as the body (♂); scape stout, not longer than second and third segments together, second segment small, about half as long as third; third segment about two-thirds as long as fourth, fourth segment shorter than fifth, remaining segments slender, subequal. Prothorax one-

fourth wider than long, subquadrate, coarsely and moderately densely punctured, densely clothed with luteus pubescence, with two smooth parallel vittæ. Elytra at base wider than prothorax, rather suddenly narrowed toward apex; punctation fine, uneven, not dense; denuded areas narrow, irregular, not vittiform; apices truncate. First segment of the posterior tarsi as long as second and third segments together. Lower surface sparsely clothed with luteus pubescence; abdominal segments each with two dense patches of pubescence at sides, separated by a smooth vitta. Length 11 mm., breadth 3.5 mm.

Holotype male, (C. A. S., Ent. No. 3726) and one paratype male, (in the collection of the writer) taken at Real d'Arriba, District of Temascaltepec, Mexico, June, 1933, by Mr. Howard Hinton and Mr. Robert Usinger. Both specimens were taken on *Thuja occidentalis*.

This fine species is somewhat suggestive of *A. confusa* in color and elytral pattern but may be distinguished at once by its greater size, elongated form, parallel thoracic vittæ and truncate elytral apices. This last character will also separate it from *A. dorsalis* which has parallel thoracic vittæ but which differs in elytral pattern.

5. Atimia helenæ Linsley, new species

Short, stout, piceous, clothed with a coarse yellowish-brown pubescence, with large denuded areas on the prothorax and elytra. Head short, broad; eyes large, finely granulated; antennæ short, scape stout, almost cylindrical, longer than the second and third segments together, second segment small, a little less than one-half as long as the third, third about two-thirds as long as fourth, fourth slightly shorter than fifth, remaining segments shorter, subequal, flattened and compressed. Prothorax transverse, subquadrate; irregularly, finely punctured; sparsely clothed with yellowish-brown pubescence, with two arcuate longitudinal vittæ; posterior angles acute. Scutellum about as long as broad, densely pubescent. Elytra gradually narrowing posteriorly; punctation fine, sparse, irregular; denuded areas confluent, more or lèss vittiform; apices rounded. Legs short; first segment of posterior tarsi not equal in length to the following two together. Lower surface rather sparsely pubescent. Length 8.75 mm., breadth 3 mm.

Holotype male, (C. A. S., Ent. No. 3727), collected at Cypress Ridge, Marin Co., Calif. on April 6, 1921, by Dr. E. C. Van Dyke; allotype female, (C. A. S., Ent. No. 3728), also from Cypress Ridge, April 26, 1921, taken by Mr. J. O. Martin; and

one paratype male, Pope Valley, Napa Co., Calif., April 1, 1932, E. C. Van Dyke, collector. All three specimens were taken on *Cupressus sargentii* Jepson, and the species probably occurs throughout the St. Helena region.

At first glance, this species might be taken for the melanic phase of *A. dorsalis*, but differs from that as well as all other known species in the rounded elytral apices, the stout cylindrical antennal scape which is longer than the second and third segments together, and the broad, flattened outer segments of the antennæ. In addition, the first segment of the posterior tarsi is smaller than that of *A. dorsalis*, being shorter than the two following segments together. This is the third recently described longicorn that is apparently restricted to the peculiar Sargent Cypress, which grows only in a few limited areas on serpentine ridges in the California foothills.

Necrology

California entomology recently has lost by death three of its workers. The passing of William Sherman Wright took one of our more active lepidopterists. Mr. Wright was born at Hardin, Illinois, April 23, 1866, and died at Laguna Beach, California, July 8, 1933. Most of his entomological work was done about San Diego, California, and it was there that the present writer first met him and learned to appreciate his sterling worth and his sincere friendship. His principal work was done on the moths, especially the Geometridæ, but he collected faithfully the butterflies of San Diego County and recently had published a revision of his San Diego County list. A fuller sketch by Prof. Essig will be found in Entomological News for January, 1933, from which some of these facts were taken.

The death on October 23, 1933, of Mr. J. G. Grundell took one of the group of earlier lepidopterists of San Francisco. A sketch of his life will be found on page 48 of this issue.

Mr. J. August Kusche, who died on March 3, 1934, after a lingering illness, was a general collector who took a special interest in the insects and added largely to our local collections. A fuller notice will appear in an early number of this journal. —E. P. Van Duzee.

TWO GENERA OF APHODIINÆ NEW TO MEXICO
(Scarabaeidæ, Coleoptera)

BY HOWARD E. HINTON

Berkeley, California

This paper, the first of a series, is the result of a study of the beetles of the sub-family Aphodiinæ in the collections of the United States National Museum and of the writer. The writer is indebted to Dr. E. A. Chapin and Dr. E. C. Van Dyke for their generous assistance in the preparation of this paper.

Genus *Euparixia* Brown

The anomalous genus *Euparixia* was erected by Brown (1927) for a singular little Scarab, *E. duncani*, found in Arizona. In the collection of Mexican and Central American Aphodiinæ sent to me for study from the United States National Museum, there is a specimen of the above species collected by J. A. Kusche at Venidio, Sinaloa, Mexico, on May 17, 1918. *Euparixia duncani* has remained until now without a congener.

Euparixia formica Hinton, new species

Elongate, convex, piceous, feebly shining; mouth-parts and anterior legs paler. Head moderately convex, basal two-thirds coarsely, densely punctate, with the extreme base more coarsely punctate, apical one-third impunctate, finely, moderately densely granulate; anterior margin of clypeus broadly and feebly emarginate when viewed from above, apex inflexed and rounded, not visible from above, sides oblique nearly to the genæ, and broadly incised before them; genæ angular, prominent.

Prothorax one-fourth longer than wide, very convex; front angles broadly rounded, prominent; side margins broadly explanate anteriorly, less explanate and more reflexed posteriorly, converging abruptly from basal one-half to constriction at basal one-fourth; the angles thus formed broadly rounded, those formed by the constriction extremely broadly rounded or nearly obliterated; surface remarkably unequally, coarsely, densely punctate at base, the punctures becoming much finer toward apex; sides nearly impunctate.

Elytra widest at apical one-third; carinæ evenly raised, about one-fourth as wide as striæ; striæ with a single row of evenly spaced, deep, coarse punctures. Scutellum elongate, triangular.

Mesosternum coarsely, densely punctate anteriorly, nearly impunctate posteriorly; extending between the middle coxæ is a low longitudinal carina; metasternum moderately punctate with a

wide, shallow, longitudinal sulcus. Ventral abdominal segments coarsely, irregularly punctate, each with a row of remarkably large punctures on the depressed anterior margin; penultimate segment narrowed at middle; posterior margin of last ventral and last dorsal segment nearly impunctate, polished. Posterior face of anterior femur and trochanter coarsely, closely punctate; anterior face highly polished; basal area of femur with a few long testaceous hairs, densely, coarsely punctate; front tibiæ with a few indistinct punctures on anterior face, outer margin with a few short setigerous hairs; posterior tibiæ with spurs unequal; first segment of hind tarsus subequal in length to the three following. Length, 4.5-5.5 mm.; breadth, 2-2.5 mm.

(Fig. 1)

Type (No. 3752, Mus. Calif. Acad. Sci.) and five paratypes were taken by R. L. Usinger and the writer at Tejupilco, District of Temascaltepec, Mexico, in June 1933, at an elevation of 3,960 feet. A paratype has been deposited in the collection of Mr. Saylor. One specimen was taken at light, and the others were taken from the refuse thrown out of the nests of the leaf cutting ant, *Atta sexdens* L.

This species may be separated from *Euparixia duncani* by its broadly rounded, non-prominent hind pronotal angles.

Genus *Rhyssemus* Muls.

Up to the present time, close to sixty-eight species of this cosmopolitan genus have been described. Of these five are known from North America. The following description makes known the sixth species:

Rhyssemus mexicanus Hinton, new species

Oblong, moderately convex, black, opaque; antennæ testaceous, legs rufo-piceous.

Head two-thirds as wide as the pronotum, moderately convex, tuberculate, with the tubercles coarser anteriorly, finer and denser posteriorly; vertex with a large oval tubercle on each side; clypeus broadly, moderately deeply emarginate, angle on each side obtuse, rounded, prominent; sides scarcely arcuate, slightly incised before genæ; genæ obtusely rounded, not prominent.

Prothorax one-third wider than long, slightly narrowed anteriorly, apical angles obtuse, sides slightly arcuate, lateral margins crenate, basal angles nearly obliterated, base feebly arcuate; disk with five transverse ridges which are well separated from the lateral margins; apical ridge very indistinct and consisting of a row of coarser tubercles, basal four ridges much more distinct and not broken up into tubercles, basal two interrupted at middle by a broad median channel, the second from the base turning and bordering the channel on each side nearly to base and then continuing for a short distance along the base between it and first basal ridge; areas between ridges moderately densly tuberculate; area near apical margin paler and obsoletely tuberculate.

Elytra subparallel, slightly wider posteriorly; each elytron with nine (including sutural) strongly raised, interrupted carinæ, alternate carinæ more strongly raised, and all becoming more interrupted posteriorly, ninth extending only half way to apex; striæ with a single row of widely spaced, coarse, shallow punctures.

Body beneath opaque, rugulose; mesosternum with a fine, high carina between the middle coxæ; metasternum with a wide, deep, longitudinal sulcus. Ventral abdominal segments opaque, rugulose, anterior margin of each segment crenate. Posterior tarsus with the first segment equal to the long spur and sub-equal to the three following. Length, 3 mm.; breadth, 1.2 mm.

Type (No. 3814, Mus. Calif. Acad. Sci.) and eleven paratypes were collected by R. L. Usinger and the writer at Tejupilco, District of Temascaltepec, Mexico, in June 1933, at an elevation of 3,960 feet. One paratype has been deposited in the collection

of the United States National Museum. All specimens were taken in rubbish near the margin of a stream, and all were covered with a stony incrustation which had to be removed before the sculpturing could be observed.

This is quite distinct from all other described North American species on account of its strongly raised and cariniform, instead of flat and tuberculate, elytral intervals. The following key will separate the North American species:

1. Elytral intervals strongly raised, cariniform; ventral abdominal segments opaque, entirely rugulose.....*mexicanus* n. sp.
   Elytral intervals not cariniform; ventral abdominal segments not entirely rugulose, often smooth and shining..... 2
2. Elytral intervals with one row of tubercles..... 3
   Elytral intervals with two rows of tubercles..... 4
3. Pronotal depressions tuberculate, not punctate *neglectus* Brown
   Pronotal depressions punctate, not tuberculate *puncticollis* Brown
4. Outer row of tubercles forming a fine, elevated, cariniform line .....*scaber* Hald
   Outer row of tubercles not forming a cariniform line..... 5
5. Clypeus nearly acute each side of emargination; intervals with rows of tubercles nearly equal; slightly elongate.....*sonatus* Lec
   Clypeus obtuse each side of emargination; intervals with the inner row of tubercles more elongate and less closely placed, outer row with tubercles smaller and more closely placed *californicus* Horn

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A NEW SPECIES OF WEST INDIAN TYTTHONYX

(Coleoptera: Cantharidæ)

BY HOWARD E. HINTON

Berkeley, California

Tytthonyx bicolor Hinton, n. sp.

Male. Elongate; clothed above and beneath with sparse pale pubescence; head above and beneath black; prothorax, mesothorax, metathorax, and abdomen reddish-yellow above and beneath; elytra, wings, legs, and antennæ black; scutellum yellow.

Antennæ long, about three-fourths the length of the body, black, strongly serrate, densely pubescent; first joint twice as long as second, joints one to two not compressed, two to four gradually increasing in length, four to eleven subequal, last joint brownish, compressed, not oval. Head black above and beneath, sparsely pubescent with pale hairs, finely rugulose; clypeus arcuately produced; mouth parts slightly infuscate; palpi black, last joint stout, acumi-

nate, and twice as long as preceding; mandibles dark testaceous, toothed on apical half; eyes globular, prominent, widely separated, finely faceted.

Pronotum subrectangular, nearly twice as broad as long, narrowed in front, anterior and posterior angles broadly rounded, front truncate, base feebly sinuate at middle, a deep median impression extending from the posterior nearly to the anterior margin, margins strongly raised; reddish yellow, shining, sparsely pubescent, irregularly and very sparsely punctate. Scutellum yellow, subquadrate, truncate at apex. Elytra black, short, just reaching the first ventral segment of abdomen, sparsely pubescent, feebly dehiscent, apices separately rounded; basal four-fifths coarsely rugulose, two indefinite, obsolete discal carinæ on each elytron; apical one-fifth evenly and more finely rugulose.

Legs slender, moderately pubescent, black; coxæ, trochanters, and extreme base of femora yellowish; penultimate joint of tarsi divided. Body beneath yellowish, sparsely pubescent; penultimate abdominal segment deeply, widely, somewhat triangularly emarginate; last abdominal segment completely divided, the genitalia lying in the cavity formed by these last two segments. Length 6 mm.

Female. Unknown.

Holotype, male No. 3745 Mus. Calif. Acad. Sci., collected at Mayaguez, Puerto Rico, June 2, 1932, by F. Mora. For this specimen I am indebted to Professor Stuart T. Danforth of the University of Puerto Rico.

Viewed dorsally, the last abdominal segment, the seventh, is deeply, widely, and roundly emarginate at the apex. On each of its apical angles (formed by the sides of the segment and the sides of the emargination) there is a prominent, conical, tubercular knob on the tip of which there is, apparently, a spiracle. From a dorsal view the last ventral abdominal segment, the eighth, is narrowly, and triangularly incised.

By the structure of the last abdominal segments, this species is more closely related to *Tytthonyx discolor* L. & M.[1] and *T. marginicollis* Mutchler[2]. From *T. discolor* it may easily be separated by its larger size, different coloration, compressed last joint of the antennæ, and by the fact that in this species the seventh abdominal segment is deeply, somewhat triangularly emarginate instead of being only shallowly, arcuately emarginate. From *T. marginicollis* it may be separated by its larger

[1] Leng, C. W. and Mutchler, A. J. The Lycidæ, Lampyridæ and Cantharidæ (Telephoridæ) of the West Indies. Bull. Am. Mus. Nat. Hist. Vol. XLVI, Art. VIII, p. 490, fig. 54, 54a (p. 487), 1922.

[2] Mutchler, A. J. Notes on West Indian Lampyridæ and Cantharidæ (Coleoptera) With Descriptions of New Forms. Am. Mus. Novitates No. 63. p. 8, 1923.

size, by the structure and color of the antennæ, the yellow instead of blackish pronotum and the black instead of yellow legs. The following simple key will serve to separate the West Indian species.

A. Last abdominal segment completely divided.
  B. Pronotum entirely yellow.....*bicolor* n. sp.
  BB. Pronotum blackish.
    C. Antennæ black.....*discolor* L. & M.
    CC. Antennæ light brown.....*marginicollis* Mutchler
AA. Last abdominal segment not completely divided.
  B. Pronotum yellow.....*cubanus* L. & M.
  BB. Pronotum blackish.....*cavicornis* L. & M.

The June Meetings at Berkeley

The Entomological Society of America will hold at least one session in connection with the summer meetings of the American Association for the Advancement of Science and affiliated societies for 1934 at Berkeley, California, June 18 to 23. The present plan is to have the Pacific Coast Entomological Society and the Lorquin Entomological Club participate in a joint meeting with the Entomological Society of America, with a program so arranged that an afternoon may be spent at the rooms of the Entomological Department of the California Academy of Sciences in San Francisco. It is hoped that a goodly number of our eastern entomologists can improve this opportunity to visit the Pacific Coast and meet with their western co-workers. Those who do come should plan so they can spend a few days in the San Francisco area before or after the meetings. They will find much to interest them, not only in the bay cities but in the country within easy reach from Berkeley, and certainly will regret it if they restrict their stay here to the actual time of the meetings. The rooms of the Entomological Department of the California Academy of Sciences, located in Golden Gate Park in San Francisco, will be open throughout the meetings and a cordial invitation is extended to all visiting entomologists to inspect the collections, now numbering almost one million mounted specimens, and to make use of its facilities for study.—E. P. Van Duzee.

A NEW PREDACIOUS MITE FROM SOUTHERN CALIFORNIA

(Acarina, Erythræidæ)

BY WALTER EBELING

Citrus Experiment Station, Riverside, California

In the course of several years of experimental work in Orange County, involving the careful examination of the branches of hundreds of lemon trees heavily infested with red scale, the writer has had an excellent opportunity to study the predacious mites infesting citrus trees. Several species he believes to be undescribed, and one of special interest is described in this paper.

Unfortunately only ten specimens of the species in question were preserved in permanent mounts. These are either all of the same sex (presumably female) or, if of different sexes, no significant differences in size of body or shape and size of the genital opening have been noticed.

Erythræus aonidiphagus Ebeling, n. sp.

Color red, or with iridescence predominantly greenish or bluish; legs red. Body 1.75 to 2 mm. in length; less than half as broad as long, broadly rounded before and behind and densely covered with many fine hairs. Dorsal groove short, reaching only as far back as the eyes, with a pair of pits or sensillæ at each end, each bearing a long spine, two eye spots on each side of the cephalothorax. Palpi 0.35 mm. in length, broad; thumb broad, not clavate, covered with many hairs; claw extending beyond thumb, only slightly curved at tip. Legs I and IV subequal, not as long as body. Fourth and fifth joints of leg I subequal and longer than the third joint; tarsus four-sevenths as long as the tibia and greatly swollen. Fifth joint of leg IV slightly longer than preceding joint; tarsus swollen, slightly less than one-half as long as the tibia.

The types and paratypes are in the author's collection.

There are at least thirteen species of *Erythraeus* described from the United States. Four were described from California, two of which (*E. mœstus* [Banks] and *E. posticatus* Banks) have been found on citrus.

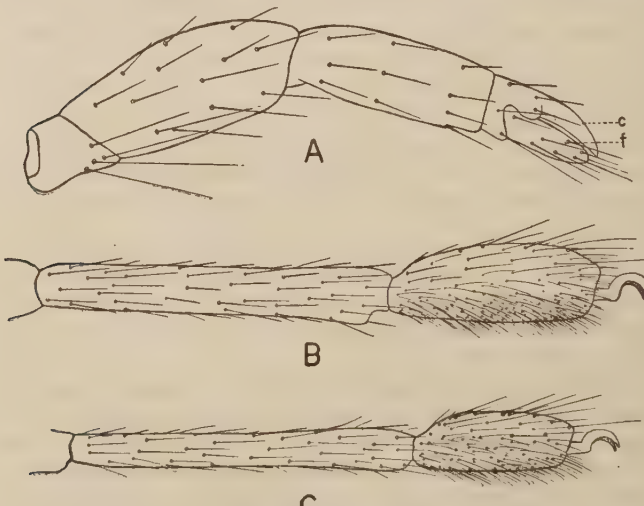
Erythræus aonidiphagus differs from *E. mœstus* in that the body is broadly rounded in front; the dorsal groove reaches only to the level of the eyes; there are two eye spots on each side of the cephalothorax; legs I and IV are not as long as the body; the claw of the palpus is not greatly curved, and the thumb is three times as long as broad. It differs from *E. posticatus* in that it has two eye spots on each side of the cephalothorax; legs

I and IV subequal, both shorter than the body; tarsus I more than two-thirds as long as the metatarsus, tarsus IV nearly half as long as the metatarsus; third segment of the palpus longer than the fourth and fifth, and the thumb not clavate and not reaching beyond the end of the claw.

These mites are not ordinarily abundant and the writer has found them only in certain groves. As high as thirty mites were found on a single tree, but ordinarily only one or two, if any, are found. They may also be seen running about on the ground beneath the trees, which may, in part, be due to the difficulty they experience in clinging to the foliage.

Attempts to breed the mites have failed and the method of reproduction is unknown. They are cannibalistic and if a number are left together in a sealed container invariably only one live mite will remain after a day or two.

The writer once observed a mite thrusting its mandibles and finally its entire cephalothorax beneath the armor of a red scale and feeding on the body of the insect. These mites also prey on red scale crawlers and other small insects and mites. If more abundant, they might be an important enemy of the red scale.



Description of Figure

Erythræus aonidiphagus n. sp. A, palpus; B, last two joints of Leg I; C, last two joints of leg IV; c, claw; t, thumb.

NEW SPECIES OF THE GENUS CHRYSOBOTHRIS, WITH A KEY TO THE SPECIES OF HORN'S GROUP IV[1]

(Coleoptera, Buprestidæ)

BY W. J. CHAMBERLIN

Forest Entomologist, Oregon State College

The genus *Chrysobothris* has long been a popular group in the family *Buprestidæ* but of late years the student has had difficulty in correctly identifying much of his material, due to the lack of a suitable key. In the introduction to his Monograph of the species of this genus[2] Dr. Horn states that it is probable that very few new species will be discovered in the group. In his Group IV, with which this paper is concerned, he lists sixteen species. In the nearly fifty years which have elapsed since his paper was published the number of species in Group IV has practically doubled, there being 31 listed in the key here presented. No attempt has been made to publish any extensive treatise on this group, although many descriptions of isolated species have appeared from time to time, and in 1910 Professor Fall published a paper[3] wherein he pointed out the errors in Horn's work, described two new species and gave a key to the eight species falling in the group near *C. californica.* The accumulation of more and more material and the appearance of the descriptions of new species here and there has now made it quite impossible to identify specimens by Horn's key. A new key incorporating the thirteen species described since 1886 and two additional species which are apparently new, is herewith presented and it is hoped that with this key, and the accompanying illustrations, the species of this difficult group may be satisfactorily determined.

It should be borne in mind that there is some variation within the species and that although the figures are, with one exception, reproduced from actual photographs the tibial dilation may not fit the picture exactly. However, by carefully observing the other details little difficulty in identifying the males will be

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[1]Published as Technical Paper No. 198 with the approval of the Director of the Oregon Agricultural Experiment Station. A contribution from the Department of Entomology.

[2]1886, Horn Geo. A Monograph of the Species of the Genus Chrysobothris. Trans. Amer. Ent. Soc., XIII, pp. 65-124.

[3]1910, H. C. Fall. On *Chrysobothris californica* and Allies. N. Y. Ent. Soc., XVIII,. pp. 45-52.

encountered. In the case of females which are not associated with males it is often quite impossible to determine them with certainty.

In making up the key I have had before me representatives of all species except *orono* Frost, and of this Mr. J. N. Knull very kindly sent me a drawing of the tibia. All other species are represented in my own collection, but in order to be able to examine more specimens, some were borrowed and I wish to express my gratitude to Dr. H. E. Burke, Mr. J. N. Knull, Mr. H. C. Fall, Mr. F. S. Carr and Mr. E. K. Gibson for loan of material.

Kerremans' species *C. horni* is based upon a single female which may or may not belong to Group IV. The status of an isolated female cannot be readily determined. The problem is not facilitated by the fact that the type locality is given as simply United States. The same is true of *C. lata* Kerremans,[5] which is supposed to have come from Florida and to be near *dentipes*.

Regarding Horn's Group V.

Dr. Horn's group V with its five species, characterized by subcylindrical, parallel form and with the upper surface slightly pubescent, offered little difficulty at the time of his revision. Since then *pubescens* Fall, *fragariæ* Fisher, *peninsularis* Schaef. have been assigned to the group and it has taken on a rather heterogeneous appearance and no longer can it be characterized as containing species of a subcylindrical form, for certainly *fragaria* and *pubescens* as well as *cyanella* are no more subcylindrical than are such species as *beyeri* Schaef., *bacchari* V. Dyke, *oregona* n. sp. and some specimens of *texana* Lec. Neither is the dorsal surface much more pubescent than we find in several species of Group IV.

The last ventral segment of *fragariæ* in the two specimens I have seen is not serrate. It is interrupted at widely spaced intervals but this cannot be termed serrate.

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[4]1903 Kerremans, Chas., Genera Insectorum, Fasc. 12 Family Buprestidæ, p. 12.

[5]1899 Kerremans Chas., Ann. Soc. Ent. Belg., Vol., 43, p. 336.

Just what should be done with this Group V is a question which might be satisfactorily answered if one had sufficient material. Unfortunately, all the species seem to be quite rare and until we are able to accumulate more material and learn something of their biology they are perhaps best left as they are, although *fragariæ* and *pubescens* could with equal propriety be placed in Group IV.

The following two new species belong to Horn's Group IV:

Chrysobothris canadensis Chamberlin, n. sp.

About the size of *C. californica* with a fascies somewhat as in *dentipes*, especially in the male. Robust, depressed, upper surface dark with faint greenish lustre; head dark above. Front coppery, (female) or greenish, (male) and shining in lower half; two callosities near middle, female with scattered very fine pubescence, male with pubescence more numerous and longer. Clypeus with a broad V-like emargination; antennæ normal, 1st and 3rd segments each more than twice as long as 2nd; 4th to 11th serrate and gradually narrowing. Prothorax twice as wide as long, entire surface with irregular raised areas, closely punctate between, median sulcus scarcely evident. Sides arcuate in male, a little wider at base than apex. In the female the base is considerably wider than the apex which is noticeably constricted, sinuate at middle, less constricted at base. Elytra wider than thorax; humeral angles rounded; sinuate to basal third, separately rounded at apices; first costa raised, smooth, almost unbroken in the apical two-thirds thence broken to the base, second much broken in the male, less so in the female, interspaces quite closely punctate. Beneath dull bronze in both sexes; prosternum not lobed, quite densely punctate and pubescent in male, much less so in female. Last ventral with serrulate margins, male with a deep semi-circular emargination at tip; female with a notch which is as deep as wide, sides parallel, rounded at bottom. Length, male 15, width 6.6 mm. Female, length 17, width 7.5 mm.

Front and middle tibia of the male arcuate, hind tibia straight. The tibial dilation occupies less than one-third the tibial length and is about twice as long as wide, starting from an indentation it widens gradually to the tip, the lamella forming an arc rising in the indentation and terminating just beyond the middle of the dilation.

Described from a series of six specimens, two males and four females, submitted by Mr. F. S. Carr of Medicine Hat, Alberta. Four specimens were taken at Banff, Alberta VII - 19 and VIII - 8.

Two at Waterton, Alberta VII - 17. In addition to the above I have one male collected August 3, 1930, at 8600 feet in the Strawberry Mountains, Grant County, Oregon, which differs but little from the typical series. This species falls in Horn's Group IV near *scabripennis* from which it is easily distinguished by its size.

Type locality Banff, Alberta. Type in author's collection. Paratypes in collection of Mr. Carr and Canadian National Collection in Ottawa.

Chrysobothris oregona Chamberlin, n. sp.

Of the size and general appearance of *C. purpurifrons* but the tibial dilation of the male places it in Group IV, where it falls close to *pusilla*. Dorsal surface bronze, shining. Thorax widest just behind the front; base narrower, closely, densely, punctate; median sulcus evident at middle but not extended to the front or hind margin. Elytra roughened, densely punctate, without raised areas; discal fovæ large shallow; costæ one and two prominent, raised, black and shining in apical three-fourths, scarcely evident in basal fourth. Costa three, evident only in middle third; elytral surface covered with scattered short, white, stiff hairs, their apices separately rounded, the serrations scarcely evident.

Front and antennæ green in male, bronze in female, segments 4 - 11 with dark-tipped lobes, gradually narrowing to apex. Prosternum of the male lobed in front, punctate and covered with long white pubescence; last ventral with serrate margins, with a wide, rather shallow emargination at tip. Front tibia of male arcuate, apex widening gradually without indentation; a lamella rises in an arc which is cut off at the middle; hind tibia nearly straight. Prosternum of the female lobed, less densely punctate and with few hairs, last ventral broadly rounded with a very small indentation at middle, lateral margins serrulate.

Described from three specimens, two males and a female taken at Bull Prairie, Lake County, Oregon, July 27; elevation 7000 feet. Types in the author's collection. There is no other species in Group IV, lobed division, that resembeles this species.

Key to the Species of Chrysobothris in Horn's Group IV.

Prosternum lobed in front..... 1
Prosternum without lobe in front..... 15

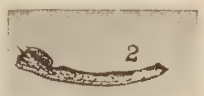
1. Tibia of ♂ with a distinct indentation or sinuation just before the dilation..... 2
Tibia of ♂ without obvious indentation before the dilation.. 4

2. Thorax without elevated black smooth areas..... 3

Thorax with elevated black smooth areas.

Dilation of front tibia of ♂ abruptly narrowed one-third before the apex.....*caurina* Horn.

Dilations of front tibia rising from a slight sinuation, thence regularly arcuate to tip, almost as broad as long.....*monticola* Fall.



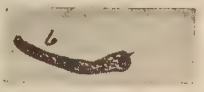
3. Tibial dilations of ♂ widest at tip.....*nixa* Horn.

Tibial dilations of ♂ narrowed at tip.....*texana* Lec.

4. Dilation of front tibia of ♂ widest at or very near the tip 5
Dilations widest in the basal two-thirds..... 8

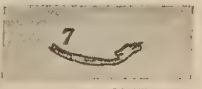
5. Median sulcus of prothorax well marked; prominent elevated smooth spaces laterally..... 6
Median sulcus practically obsolete and without prominent elevated areas..... 7

6. Femoral tooth long and acute; tibial dilations feeble; legs bronze.....*exesa* Lec.



Femoral tooth rounded; tibial dilation short and abrupt, legs green.....*falli* Van Dyke.

7. Head and pronotum brilliant cupreous; costæ distinct and scarcely interrupted.....*lineatipennis* Van Dyke.

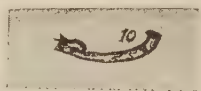


Entire upper surface dull bronze; elytral costæ faintly discernible and considerably broken up.....*mali* Horn.

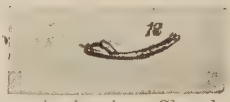
8. Pronotum without prominent elevated smooth areas..... 9
Pronotum roughened, with elevated smooth areas..... 12

9. Small species five-sixteenths or less;
Eastern states.....*pusilla* L. & G.
Larger species three-eighths or more in length, Western states 10

10. Head and antennæ of ♂ green; clypeal emargination broad shallow; tibial dilation short about one-fifth length of tibia.....*oregona* n. sp.
Head and antennæ bronze in both sexes..... 11



11. Tibial dilation nearly one-third of tibial length, widest about the middle thence tapering sharply to the front.....*beyeri* Schaef.
Tibial dilation about one-fourth the length of the tibia, widest behind the middle, thence sinuate and widening slightly at tip.....*bacchari* Van Dyke.
12. Form large, broad; median sulcus of thorax prominent..... 13



Form small, narrow; median sulcus, scarcely evident.....*juniperinus* Chamb.

13. Elytral costæ sinuous; head and thorax metallic, shining.....*blanchardi* Horn.
Costæ interrupted, expanded in broadened smooth areas..... 14

14. Clypeal emarginations of ♂ semicircular; front with numerous raised smooth areas.....*woodgatei* C. & N.

Clypeal emargination broad, shallow, front with four small callosities.....*quadrilineata* Lec.
15. Color above bright shining blue or green.....*harrisi* Hentz.
Color dark bronze to nearly black..... 16

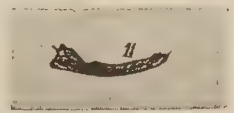
16. Segments 4 to 11 of the antennæ with testaceous lobes..... 17
Segments of antennæ more or less homogeneous throughout, no testaceous lobes..... 18

17. Head bronze in both sexes; dilation of the anterior tibia of ♂ gradually broadened to tip.....*dentipes* Germ.

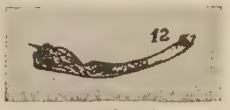
Head greenish (less so in ♀); dilation of the anterior tibia of ♂ abruptly broadened into a tooth-like projection, thence narrowed to tip.....*verdigripennis* Frost.

18. Front tibia of ♂ with a distinct indentation just before apical dilation..... 19
Front tibia of ♂ without indentation before the apical dilation 24

19. Tibial dilation widest behind the tip usually at, or posterior to, the middle..... 21
Tibial dilation widest at or near the tip..... 20



20. Species small, less than one-half inch long; ♂ tibial dilation serrulate.....*scabripennis* Cast.



Species more than one-half inch in length, tibial dilation of ♂ gradually and uniformly broadened from base to near the tip.....*canadensis* n. sp.

21. Antennal segments 4 to 11 of approximately the same width.....*ludificata* Horn.
Antennal segments 4 to 11 gradually narrower..... 22

22. Body beneath bronze in both sexes; tibial dilation of ♂ nearly as broad as long.....*breviloba* Fall.
Body beneath shining green in ♂ and at least some greenish reflections in ♀..... 23

23. Prosternum ♂ not densely punctate; tibial dilation occupies at least one-third the tibiæ length.....*pseudotsugæ* Van D.

Prosternum ♂ densely and finely punctured; tibial dilation occupies approximately one-fourth the tibial length....*laricis* Van Dyke.

24. Disc of thorax not distinctly sulcate; species blue-black above, no metallic luster.....*dolata* Horn.

Disc of thorax with evident median sulcus; species with bronze or cupreous reflections above..... 25

25. Tibial dilation narrow, more than one-third as long as tibia; legs purplish bronze; species of large size.....*californica* Lec.

Tibial dilation of ♂ less than one-third as long as tibiæ; species smaller..... 26

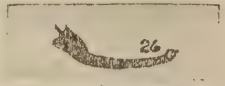
26. Prosternum sparsely pubescent and sparsely punctate; tibial dilation of ♂ long and narrow.....*carinipennis* Lec.

Prosternum densely pubescent and densely punctate; tibial dilation nearly as broad as long..... 27

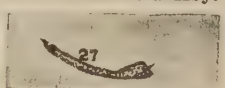
27. Prothorax narrower at apex than at base; color nearly black above; antennal segments 4 to 11 with black lobes.....*orono* Frost.

Prothorax not narrower at apex than base; antennal segments without black lobes..... 28

28. Upper surface with distinct bronze reflections, both sexes bronze beneath, ♀ with slight greenish tinge.....*trinervia* Kby.



Upper surface with dark greenish reflections; beneath bright metallic green in ♂; darker in ♀.....*sylvania* Fall.



A NEW GENUS AND TWO NEW SPECIES OF LEAFHOPPERS FROM CALIFORNIA[1]

(Homoptera Cicadellidæ)

BY R. H. BEAMER

Penehuleria Beamer, new genus

Resembling *Huleria* in size and general appearance but with very long vertex, almost twice as long as width between eyes and with median longitudinal ridge; elytra with two cross-nervures instead of one and five apical cells instead of four. Ocelli on margin of vertex about four times their diameter anterior to eye.

Type of genus *Penehuleria acuticephala* n. sp.

Penehuleria acuticephala Beamer, n. sp.

Resembling *Huleria 4-punctata* Ball but with the vertex long and narrow, usually twice as long as distance between eyes and with distinct external genitalia.

General color dirty brownish buff with disc of vertex and scutellum lighter. Elytra semihyaline with brown of body showing distinctly, veins lighter. Face yellowish white bordered with fuscous line from eye to eye. From ocelli to eye the dark line divides enclosing a small white area, upper portion of fork visible on vertex as a small angular spot.

Structure: Vertex very long and narrow, usually about twice as long as distance between eyes; lateral margins sharp almost foliaceous, straight from ocelli to apex, angle of divergence increasing from ocelli to eye; with mesal longitudinal ridge from apex to base. Pronotum about as wide as eyes, posterior margin deeply sinuate. Elytra longer than abdomen, of about same venation as *H. 4-punctata* Ball except one additional apical cell and two cross nervures instead of one.

Genitalia: Last ventral segment of female slightly longer than preceding, posterior margin almost straight with narrow mesal v-shaped notch. Male valve as long as preceding segment, bluntly angular; plates about same width as valve at base, slightly larger just beyond, then evenly narrowing to sharp apices; almost three times as long as valve. Pygofer drawn out into long slender, dorsally curving black tipped spine, this spine almost as long as the plates.

Holotype ♂, allotype ♀ and 2 ♂ and 11 ♀ paratypes, Mint Canyon, Calif., July 6, 1933, R. H. Beamer.

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[1] Contribution from the Department of Entomology, University of Kansas, Lawrence, Kansas.

Two nymphs apparently belonging to this species were swept from a sorgum like grass. The adults were mostly taken from live oak trees in the same vicinity.

Erythroneura inclita Beamer, n. sp.

Resembling *Erythroneura bilocularis* Van D. but easily separated by absence of any dark coloring on pronotum or scutellum.

Color: General ground color ivory more or less suffused with golden yellow, with brilliant red markings. Vertex with disc mostly red, sometimes divided into two areas by mesal white vitta. Pronotum with disc red, also occasionally divided mesally with white vitta. Scutellum with basal angles golden yellow, margined with red on inner sides connected with red apex. Clavus red except outer two-fifths and oval spot near apex of scutellum. Corium more or less golden yellow on costal margin and apical third, remainder red or red-dotted except white areas opposite basal spot of clavus and an elongated one next apex of clavus. Venter stramineous to yellow. Apex of ovipositor black.

Genitalia: Style with usual type short foot of western species. Oedæagus long, in dorsal view straight, tip hollowed out, flaring: in lateral view roundingly curved at base, shaft heavy at base tapering to slightly dorsally bent tip, with a pair of heavy lateral, closely apressed processes ending about one-third distance from tip. Pygofer with two hooks, the lateral one with heavy base, apical one long and slender heavier than the corresponding one in *E. bilocularis* Van D. which this species closely resembles in form of male genitalia.

Holotype, male, allotype, female and numerous paratypes. San Jacinto Mts., Calif., July 21, 1929, R. H. Beamer.

Note on the Alder Scale

What appears to be the alder scale, *Xylococcus betulæ* Pergande, has recently been taken a number of times by County Agricultural Commissioner, Mr. L. R. Cody, on prune trees in the Santa Clara Valley. So far as I know this is the first record of a scale of this type being found on fruit trees. Its presence is indicated by a slender white thread which protrudes, usually from a crotch in a small branch or at the base of a leaf bud, the female being imbedded in the tissues of the plant. This scale occurs normally on alder and birch in Oregon and California and is common in the Eastern States.—E. O. Essig, University of California.

Proceedings of the Pacific Coast Entomological Society

The One Hundred and Twenty-sixth Meeting

The 126th meeting of the Pacific Coast Entomological Society was held in the rooms of the California State Department of Agriculture, Room 10, Ferry Building, San Francisco, September 12, 1931, at 8 p. m., President Van Dyke in the chair. The following were in attendance: E. C. Van Dyke, E. R. Leach, A. T. McClay, George R. Wilson, Donald Kelly, Robert Usinger, Elwood C. Zimmerman, Theron Davis and Robert Wind, members, and Paul S. Bartholomew, L. A. Mead, Albert Mead, Lawrence Saylor and Howard E. Hinton, visitors.

After reading of the minutes of the previous meeting and of the Treasurer's report, President Van Dyke stated that he had held the office of President for 21 years and it was his wish that some other member should take over the duties of the office for a time. He then appointed G. R. Wilson, A. T. McClay and Donald Kelly a committee to nominate officers for the ensuing year. Dr. Van Dyke then called attention to some interesting captures of Coleoptera during the year, especially of the finding of a pair of an *Amblycheila*, probably *picolominii* Reiche,[1] by Mr. Joseph Slevin at Skidoo in the Argus Mountains, California. Mr. Leach stated that specimens in the U. S. National Museum, determined as *picolominii* by Walter Horn were not like these taken by Mr. Slevin and thought the latter might prove to be new. Dr. Van Dyke then reported the capture by J. A. Kusche of *Cicindela longilabris perviridis* with more than normal extension of the yellow markings, thus resembling *C. laurentia* of Colorado, and the capture by him of *Scaphonotus longiceps* Van Dyke, north of Arcata, California, the second reported taking of this species, a species that exhibits a remarkable adaptation to its habit of feeding on helicid snail shells. He also called attention to the Helmidæ as an interesting family much in need of revision, and noted the following miscellaneous captures: *Glyptoselimorpha marmorata* by Alonzo Davis, *Nanularia cupreofusca* by Mr. Saylor and of *Diphyllostoma linsleyi*.

Donald Kelly and Robert Usinger told of collecting insects at Coffee Creek in Trinity County, and Robert Wind gave an account of his collecting experiences in Wyoming where he found *Euphydryas gilletti* in numbers along Snake River.

Paul Bartholomew reported success in adding to the local list of Aphididæ, Mr. Leach reported on his collecting in Mendocino County, and Mr. Zimmerman and Mr. McClay on their summer's collecting. Mr. Wilson gave an interesting account of his experiences while inspecting shipping, and of some of the difficulties encountered.

[1] Later determined as *Amblycheila schwarzi* W. Horn.

Mr. Albert Mead and Howard E. Hinton were elected to membership. The nominating committee reported that they had not yet reached a decision but would report at the next meeting.

The One Hnndred and Twenty-seventh Meeting

The 127th meeting of the Pacific Coast Entomological Society was held Saturday, December 5, 1931, at 8 p. m. in the rooms of the California State Department of Agriculture, Room 10, Ferry Building, San Francisco, Dr. E. C. Van Dyke in the chair.

The following were in attendance: E. C. Van Dyke, George F. Ferris, H. E. Burke, E. R. Leach, E. P. Van Duzee, George R. Wilson, E. Gorton Linsley, Michael Doudoroff, J. F. Killeen, Donald Kelly, Robert Usinger, John Steinweden, George R. Struble and E. C. Zimmerman, members, and F. D. Klyver, L. A. Mead, Howard McKenzie and Theron Davis, visitors.

After the reading of the minutes of the previous meeting Dr. Van Dyke opened a discussion on the advisibility of continuing the separate publication of the Proceedings of the Society. On motion of Dr. Burke it was decided to publish the minutes in the Society's journal the Pan-Pacific Entomologist, for a time at least.

Mr. Linsley suggested that as there had been some enquiry concerning Life Membership in the Society that a fee for such membership be established, and on motion of Mr. Steinweden the Chair appointed Messrs. Leach, Steinweden and Linsley a committee to consider such membership and report at the next meeting.

Mr. Lawrence Saylor, Mr. Theron Davis and Mr. Howard McKenzie were elected to membership in the Society.

Mr. Van Duzee then extended an invitation to the Society to hold its meetings in the rooms of the Entomological Department of the California Academy of Sciences, and suggested that the meetings be held on Saturday afternoons instead of at night as at present. It was decided to hold a special meeting at the Academy rooms in the afternoon of January 16, 1932, and to decide later on a permant meeting place.

Professor Ferris then gave an account of his experiences while studying at Cambridge University, England. Following this there was a short discussion as to whether memory persisted from larva to adult live in insects.—J. O. Martin, Secretary.

The One Hundred and Twenty-eighth Meeting

The 128th meeting of the Pacific Coast Entomological Society was held Saturday, February 27, 1932, at 8 p. m. in the new rooms of the California State Department of Agriculture, Agricultural Building, Embarcadero, San Francisco, President Van Dyke in the chair.

The following were in attendance: E. C. Van Dyke, E. P. Van Duzee, E. R. Leach, G. F. Ferris, Donald Kelly, Earl D. Duncan,

Ellwood C. Zimmerman, Graham Heid, F. E. Blaisdell, Mrs. F. E. Blaisdell, George R. Wilson, E. O. Essig and J. O. Martin, members, and Peter Ting and Henry Mosher, visitors.

After reading of the minutes and the Treasurer's report Mr. Leach reported the following ticket selected by the nominating committee: for President Prof. G. F. Ferris, for Vice President Prof. E. O. Essig, for Secretary-Treasurer J. O. Martin. No other nominations being offered these were elected as officers for the coming year.

Mr. Leach moved a vote of thanks and appreciation for the many years of faithful service Dr. Van Dyke had given the Society. The Secretary then read a letter of resignation from Mr. W. D. Reed. After discussion the selection of a place for the annual field meeting was left to Prof. Essig and Dr. Van Dyke. On motion of E. C. Zimmerman the Secretary was directed to furnish credentials from the Society for Dr. Van Dyke to the meeting of the Fifth Entomological Congress to be held at Paris, July 17-23, 1932.

The Chair then appointed Prof. Essig and Mr. Leach as delegates to the meeting of the Affiliation Committee of the Pacific Division of the American Association for the Advancement of Science.

Mr. Van Duzee gave an account of the growth of the insect collections at the California Academy of Sciences. When he took the Curatorship of the Department of Entomology in 1916 the collection contained about 30,000 mounted specimens, it now numbers over 880,000 mounted insects, including 14 complete collections, the latest received of these being the Diptera collection of his brother Millard C. Van Duzee of Buffalo, N. Y. This collection of Diptera contains 196 types and otherwise is of special value to the Academy for the very full representation of eastern species. In addition to the Diptera there are many interesting Hymenoptera and Coleoptera. Mr. Van Duzee further stated that his brother was a specialist in certain families of the Diptera and was still studying these and adding to the collection.

Mr. Wilson described the new quarters of the State Quarantine Office and told of some of the work being done by the Department.

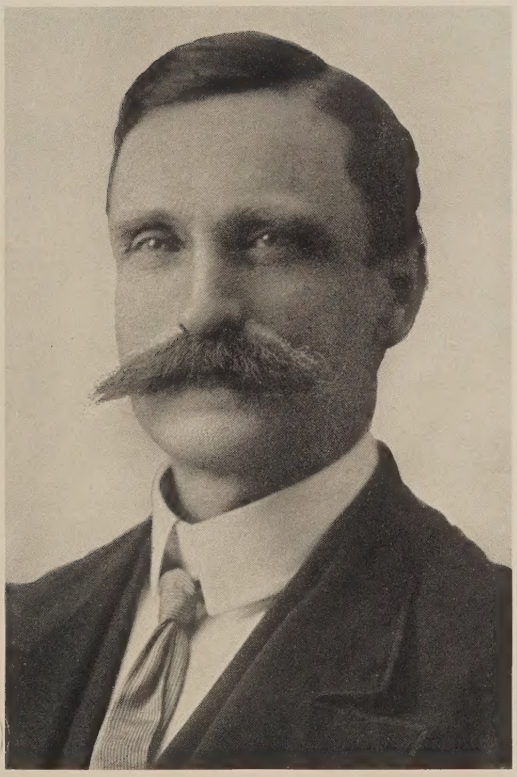
Dr. F. E. Blaisdell gave an interesting account of his experiences in raising larvæ of certain Tenebrionid beetles, Mr. Ting told of his work on the mouth parts of the weevils, and Prof. Ferris spoke of his studies on the Mallophaga and Mr. Klyver of his work on the Chermidæ.

Mr. Duncan related his discovery in the Big Basin Region, California, of a remarkable colony of vespids that evidently had overwintered and, starting in the spring with several queens, had attained the unusual size of two and a half feet by three feet, and was estimated to contain about 30,000 individuals.—J. O. Martin, Secretary.

JULIUS GEORGE GRUNDEL

Julius George Grundel was one of that group of California Entomologists which included such men as J. J. Rivers, L. E. Ricksecker and Charles Fuchs. They belonged to the period immediately following the pioneer period which contained such notable entomologists as P. V. M. Lorquin, Hermann Behr, Henry Edwards and James Behrens. Mr. Grundel was born in 1857 in Frankfort on the Main, Germany, came to America in 1871 with his parents and settled in San Francisco. The elder Grundel was a dealer in pipes and tobacco and an expert carver in ivory, meerchaum and amber. When the son was old enough he joined his father in the business and soon became also an expert ivory carver. The first store was at Kearney and Clay, later moved to Market Street, and after his father's death, the son established a factory at Sacramento and Sansome streets. In 1883 he gave up his business and bought a ranch in the Santa Cruz Mountains, later moving to Oakdale. He died on October 20, 1933, at the home of his stepdaughter, Mrs. C. N. Farmer, in Vallejo. Two brothers, Emil and Otto, of San Francisco, a son, Irving at San Jose, and a daughter, Mrs. Jack Plummer of San Francisco, survive him.

Mr. Grundel was proficient not only as a carver of ivory and meerchaum, but as a budder and grafter in horticulture and as an insect collector. He became interested in collecting insects while a boy in Germany and kept up his interest throughout his life. He wrote little, but devoted much of his leisure time to collecting and studying insects in the field and in building up quite an extensive collection of Lepidoptera. This last was deeded to the California Academy of Sciences in 1906, soon after the great San Francisco fire, which, with several other collections left to that institution at about the same time, furnished the foundation for its present first class collection of Lepidoptera. While Mr. Grundel published but little he aided his brother entomologists in their studies by furnishing both information and specimens, and as a result several species bear his name. He was a charter member of the Pacific Coast Entomological Society and until recent years, quite a regular attendant at its meetings.—Edwin C. Van Dyke.



Julius George Grundell
1857-1933

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